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DULL CHIPPING TOOLS CAUSE FIFTEEN PERCENT LOSS IN GUM YIELD

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It has long been realized that sharp chipping tools are important for good naval stores practice. Wyman and Coulter in "Florida Naval Stores," Florida Forest Service, Bulletin No. 9, July 1933, point out that high yields are obtained from even, regular streaks made with sharp tools. Although most operators realize that it is desirable to use sharp tools so that clean rather than bruised streaks are made, it is doubtful if they are aware of the large yield difference which results.

Several operations were canvassed to note the actual condition of the hacks used by chippers. Chippers' intentions are invariably good in regard to using sharp tools, but some apparently do not realize the length of time tools remain sharp. Most of the chippers sharpen their hacks when first starting work, again after the noon hour, and occasionally during the day according to the hardness of the timber in which they work. A few sharpen their hacks at the first of the week and do not touch them again for a day or so. Experience has taught the older chippers the additional advantage of using sharp tools, to make their work easier, but this is not true of the younger chippers.

In the summer of 1934 the Southern Forest Experiment Station initiated an experiment on its Olustee Experimental Forest in north Florida to determine the effect of sharp and dull hacks on gum yield. The dull hack used was one which had become dull through use and which had not been sharpened (but allowed to become even duller) during the course of the experiment. The sharp hack was one used on the regular chipping experiments and was consistently kept sharp.

Twenty trees of approximately the same diameter and growth rate were selected for study. These trees were chipped uniformly with the same sharp hack for 9 weeks during which time yields were recorded individually for each tree. At the end of the 9-week period the trees were placed into 2 groups of equal yielding capacity, an "A" group and a "B" group. For 7 weeks during the fall, group "A" was then chipped with the sharp tool, and group "B" with the dull tool. Beginning again in April 1935, the treatments were reversed and for 7 weeks group "B" was chipped with the sharp tool and group "A" with the dull tool. Three more reversals were made at intervals of 10 weeks, 8 weeks, and 5 weeks, respectively. The study was discontinued after each group had received 5 treatments with sharp hack and 5 treatments with dull hack.

Gum yields were analyzed taking into consideration the temperature on the day of chipping, the number of weeks since chipping began, and the character of the tool. Figure 1 shows the "A" group yields and "B" group yields, plotted over the number of weeks since the inauguration of chipping after differences due to temperature were allowed for in the Statistical analysis of the data.

It will be noted from this chart that when the "A" group was chipped with a sharp hack and the "B" group with a dull hack, the "A" group yields were consistently higher than those of the "B" group. This is shown by the difference between "A" group yields and "B" group yields, as the sharp and dull tools are reversed for the various periods. These differences can be readily followed on the curves. The times at which the tools were reversed are indicated.

To obtain the effect of a dull tool on yields the difference between the sharp-group yields and the dull-group yields was computed as a percentage of the sharp-group yield. For the entire 1½ years' work the dull tool averaged 15 percent less yield than the sharp tool.

Simple percentage differences in gum yield, however, do not tell the whole story. A reduction in yield is not only reflected in the total output of the operator, but it also results in a considerable increase in the cost of production per unit. The result is, therefore, a double loss. A hypothetical example will illustrate the economic principle involved.

Since the selling price, as well as practically all of the costs of production of turpentine and rosin, fluctates continually, no set of costs would be applicable for any considerable length of time. For purposes of illustration, however, this is not so serious, because the same principles apply and the changes are only in degree. Therefore figures applying at any particular time give at least a good indication of the effect of improved practices on profit or loss. For this reason in the following example use is made of figures presented by Wyman and Coulter in "Florida Naval Stores," Bulletin No. 9, page 45, table IV.

Operators working a 40-unit crop will get only 34 unit barrels if it is worked with a dull hack, i.e., a reduction of 15 percent from 40 units. The costs for dipping, scraping, hauling, and still operation are the same whether 34 or 40 units are produced, assuming that the operator produces enough or does sufficient custom stilling so that his still is kept running at capacity. His fixed costs, such as hanging, chipping, lease, interest, depreciation, etc., are charges that he must pay on each crop worked regardless of the yield. Therefore the cost per unit varies with the number of units produced. The following table shows the returns per crop using a dull and a sharp tool.

Yields, Costs, and Differences in Profit
From Sharp and From Dull Tools (1929 Costs and Selling Prices)

Tool used	Yield per crop	Per-unit costs dependent on yield	Per-unit costs[1/] independent of yield	Total cost per unit	Selling price per unit	Profit per unit
	Units	Dollars	Dollars	Dollars	Dollars	Dollars
Sharp	40	15.87	40.49	56.36	67.82	11.46
Dull	34	15.87	44.61	60.48	67.82	7.34
					Loss due to dull tool:	4.12

1/ Includes cost of selling.

Thus with prices prevailing in 1929 a turpentine operation of 10 crops capable of yielding 40 units per crop would make 400 units at a profit of $11.46 per unit or a total profit of $4,584.00. The same place using a dull tool would make only 340 units at a profit of $7.34 per unit or a total of $2,495.60. A net loss of $2,088.40 would, therefore, be directly chargeable to dull hacks. With present lower prices an even greater loss would occur.

An alert operator must, therefore, be particular in seeing that his chippers use sharp hacks constantly, so that they make clean-cut rather than haggled streaks.

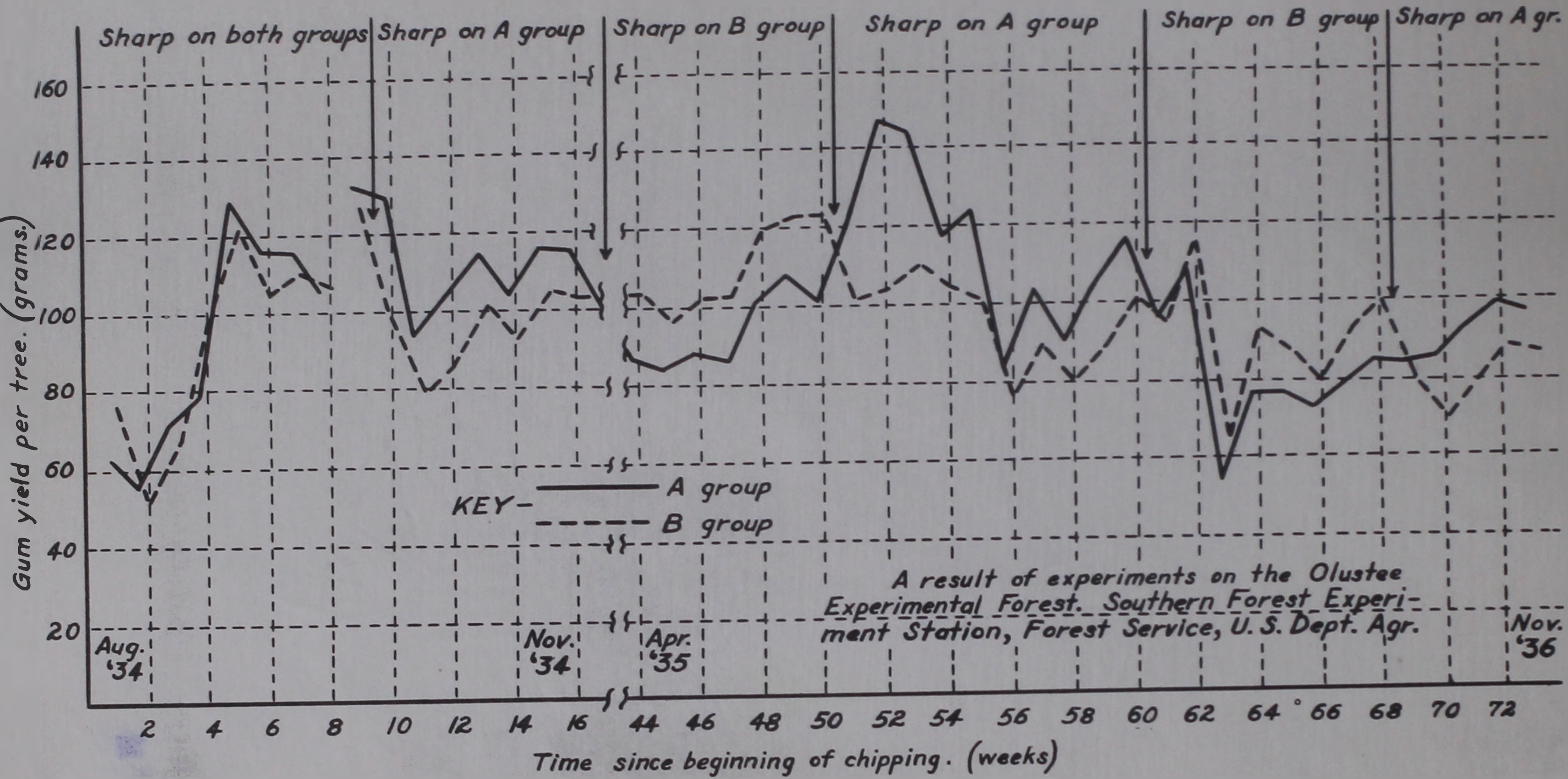

Figure 1. — The effect on the yield of gum of chipping with a dull vs. sharp hack.